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[Title of the invention] 3-dimensional viewer system for surgery

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[Claim]

1. A 3-D viewer system for surgery which enables an observer to observe regions to be put under surgical operation selectively, comprising:

a storage which stores data obtained by pre-scanning a body of a patient;

a viewer which is movable in any direction and synthesizes a 3-D image displayed on a monitor on the basis of a direct-view image of said body and said data; and

a 3-D processor which synthesizes a 3-D image with said data according to the position and direction of said viewer, and sends said 3-D image to said monitor.

[Brief description of drawings]

Fig. 1 is a schematic view of a 3-dimensional (3-D) viewer system for surgery of one embodiment of the present invention.

Fig. 2 is a cross-sectional view of a viewer.

Fig. 3 (a)(b) are examples of monitor images.

Fig. 4 is an example of a direct-vision image.

Fig. 5 is an example of a synthesized image.

Fig. 6 is an example of different monitor images.

Fig. 7 is a schematic view of an arm system.

1. 3-D storage
2. viewer
3. 3-D processor
4. patient
5. arm
6. doctor
7. monitor
8. half mirror
9. lens
10. fixing frame
11. focus
12. wireframe

[Technical Field]

This invention relates to a 3-dimensional (3-D) viewer system for surgery to obtain surgical plan information.

[Embodiment]

Fig. 1 shows a 3-D viewer system for surgery according to the present invention. Voxel data obtained by CT scanning a patient 4 are stored in a 3-D storage 1. Any voxel data are obtainable by extracting a given region on the basis of 3-D data comprised of a plurality of slice images (2-D data) obtained by CT scanning a body of the patient 4 in the axial direction of the body. A viewer 2 is fixed at a given position via an arm 5, and is movable in any direction. As shown in Fig. 2, the viewer 2 enables a doctor 6 to observe a direct-view image of the patient 4, and also enables the doctor 6 to observe a synthesized image via a half mirror 8. The synthesized image is comprised of a 3-D image displayed on a monitor 7 on the basis of the voxel data and the direct-view image of the patient 4. A 3-D processor 3 synthesizes a 3-D image with the voxel data stored in the 3-D storage 1 according to the position and direction of the viewer 2, and

displays the 3-D images on the monitor 7. A pair of viewers 2 is prepared to enable the doctor 6 to observe the synthesized image as a stereo image. Fig. 3 (a)(b) show examples of 3-D images displayed on the monitor 7. Fig. 3 (a) shows a focus 11, and Fig. 3 (b) shows the focus 11 overlaid on a wireframe of surface of an internal organ. Fig. 3 (a)(b) are displayed as stereo images. Fig. 4 shows the direct-view image. The 3-D image and the direct-view image are synthesized by the half mirror 8, and the synthesized image as shown in Fig. 5 is observed.

The position and direction of the viewer 2 is detected by the arm 5, and information of the position and direction is sent to the 3-D processor. On the basis of the information, the 3-D processor sends observed 3-D images P_1 , P_2 as shown in Fig. 6 to the monitor 7 to display them on it. The 3-D processor synthesizes 3-D image observed from the viewer 2 with the data stored in the 3-D storage 1 (i.e., voxel data, wireframe data, internal organ data, etc.). The patient 4 is fixed by a fixing frame 10.

Fig. 7 shows a construction of the arm 5. The position and direction of the viewer 2 is changed by rotating it about a point C.

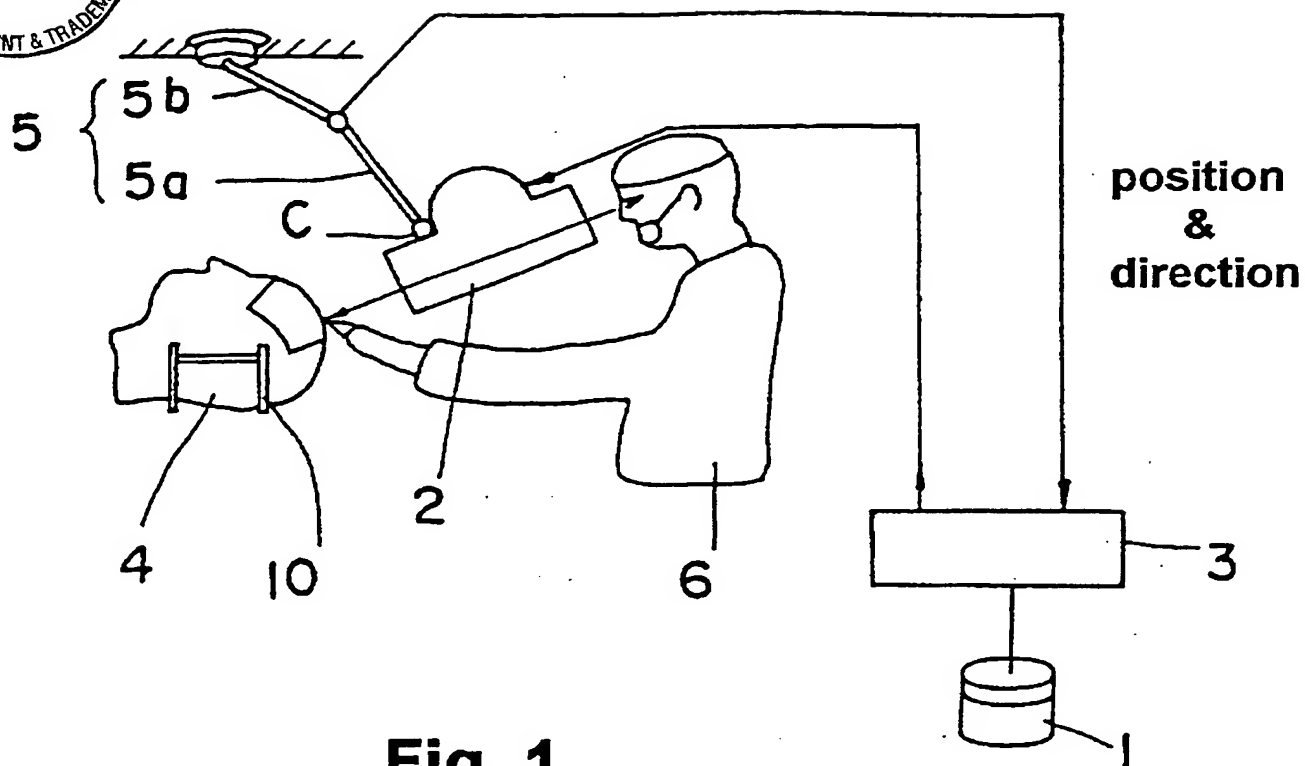


Fig. 1

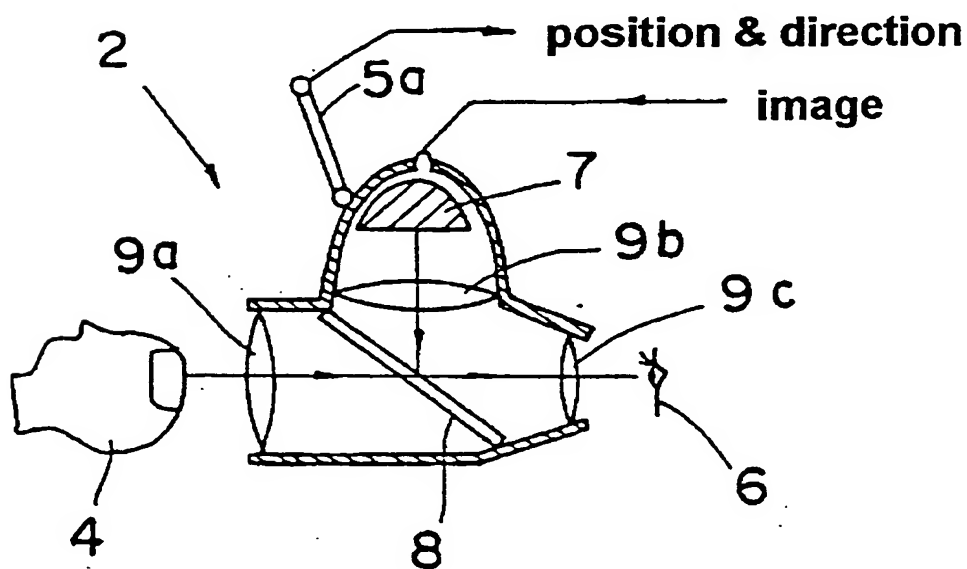


Fig. 2

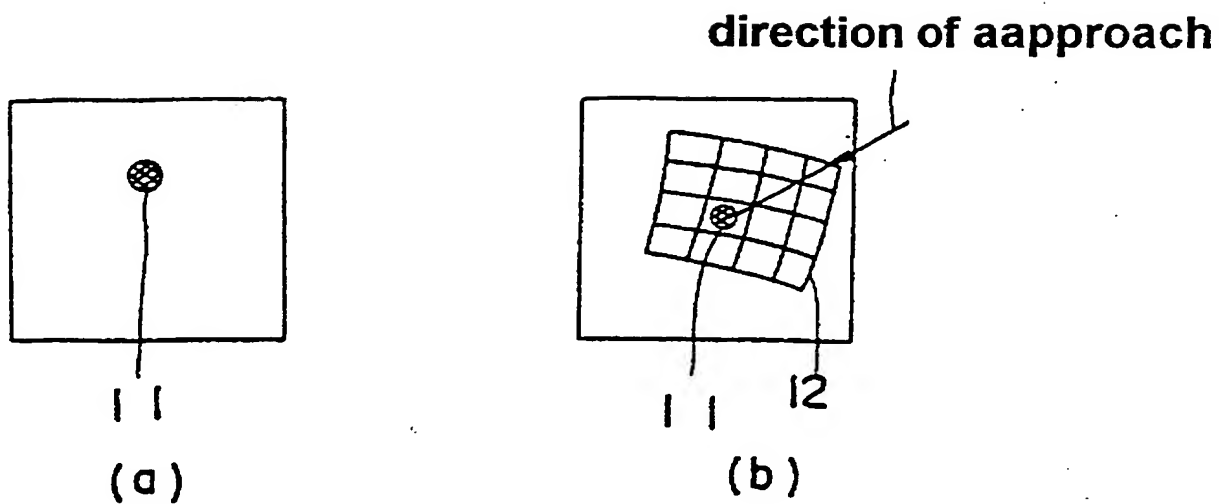


Fig. 3

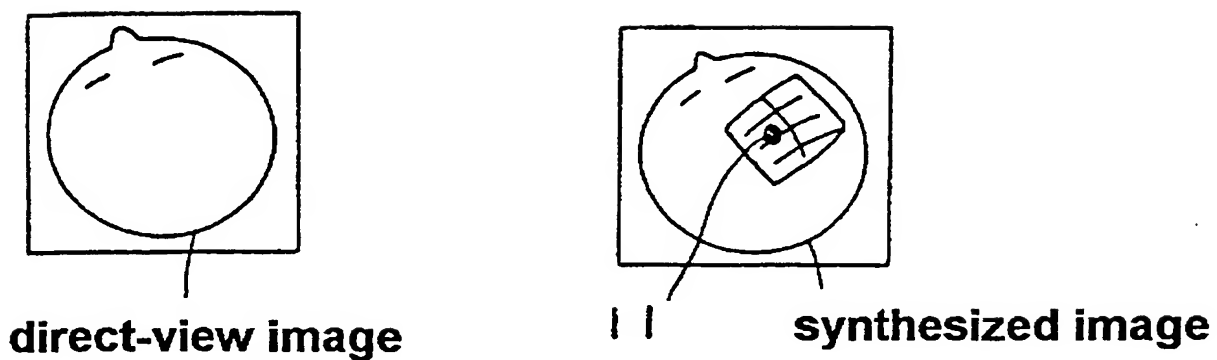


Fig. 4

Fig. 5

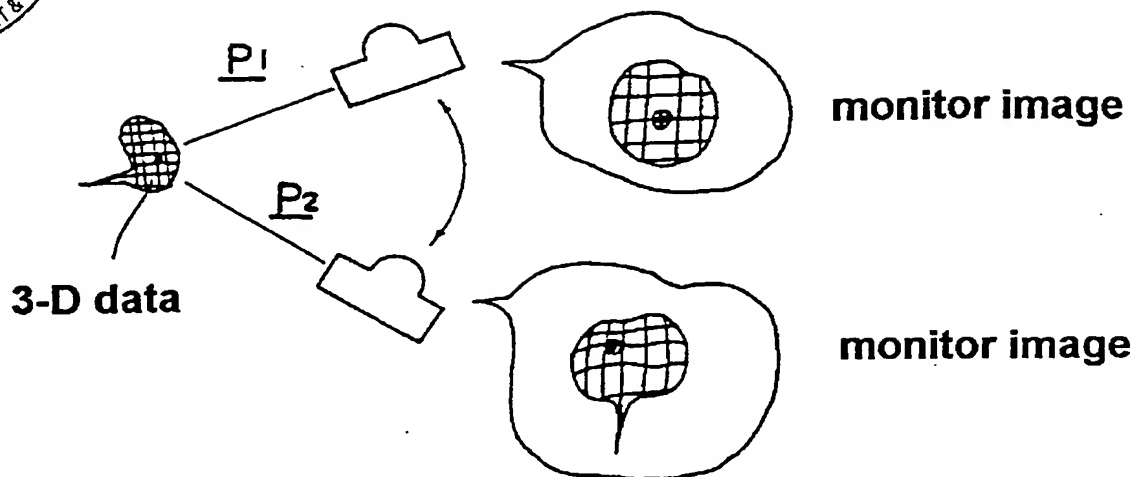
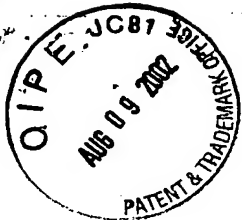


Fig. 6

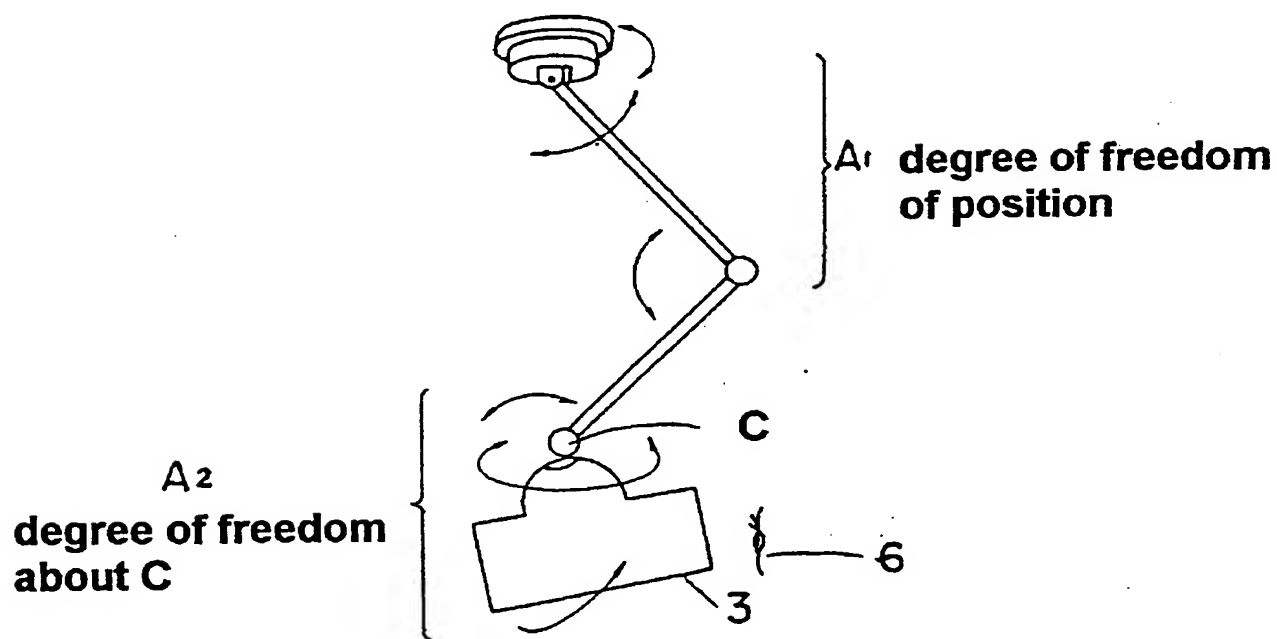


Fig. 7